NOAA

Alaska SAR Demo

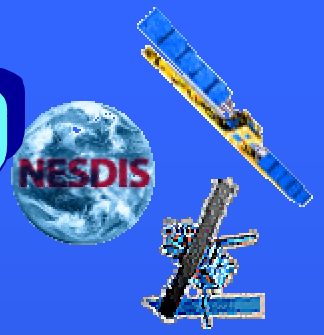
Alaska SAR Demonstration (AKDEMO)

ASF
ACT
VERIDIAN
ERIM International
NESDIS
JPL
HAZMAT

ALASKA SAR DEMONSTRATION
USER MEETING

Fairbanks - 9/26/00, Juneau - 9/27/00, Anchorage - 9/28/00

NOAA Alaska SAR Demo



AKDEMO USER MEETING AGENDA

8:30 am - Overview and Status of Alaska SAR Demonstration - Bill Pichel (NOAA/NESDIS)

9:10 am - Overview of SAR Observations of Winds - Chris Wackerman (Veridian ERIM International)

9:30 am - Alaska SAR Demonstration Wind Image Products - Frank Monaldo (JHU Applied Physics Laboratory)

10:15 am - Break

10:30 am - Alaska SAR Demonstration Wind Vector and Vessel Detection Products - Chris Wackerman

11:30 am - User Presentation (Fairbanks - TBD, Juneau - Fritz Funk, Anchorage - Rance Morrison)

11:50 am - Lunch

1:15 pm - System Performance - Ralph Meiggs and William Tseng (NOAA/NESDIS)

1:30 pm - WWW Image Processing Environment (WIPE) Current Configuration and New Capabilities - Erick Malaret (Applied Coherent Technology Corporation)

3:00 pm Break

3:15 pm New Products and User Discussion/Feedback - Pablo Clemente-Colón (NOAA/NESDIS)

4:30 Adjourn

NOAA

Alaska SAR Demo

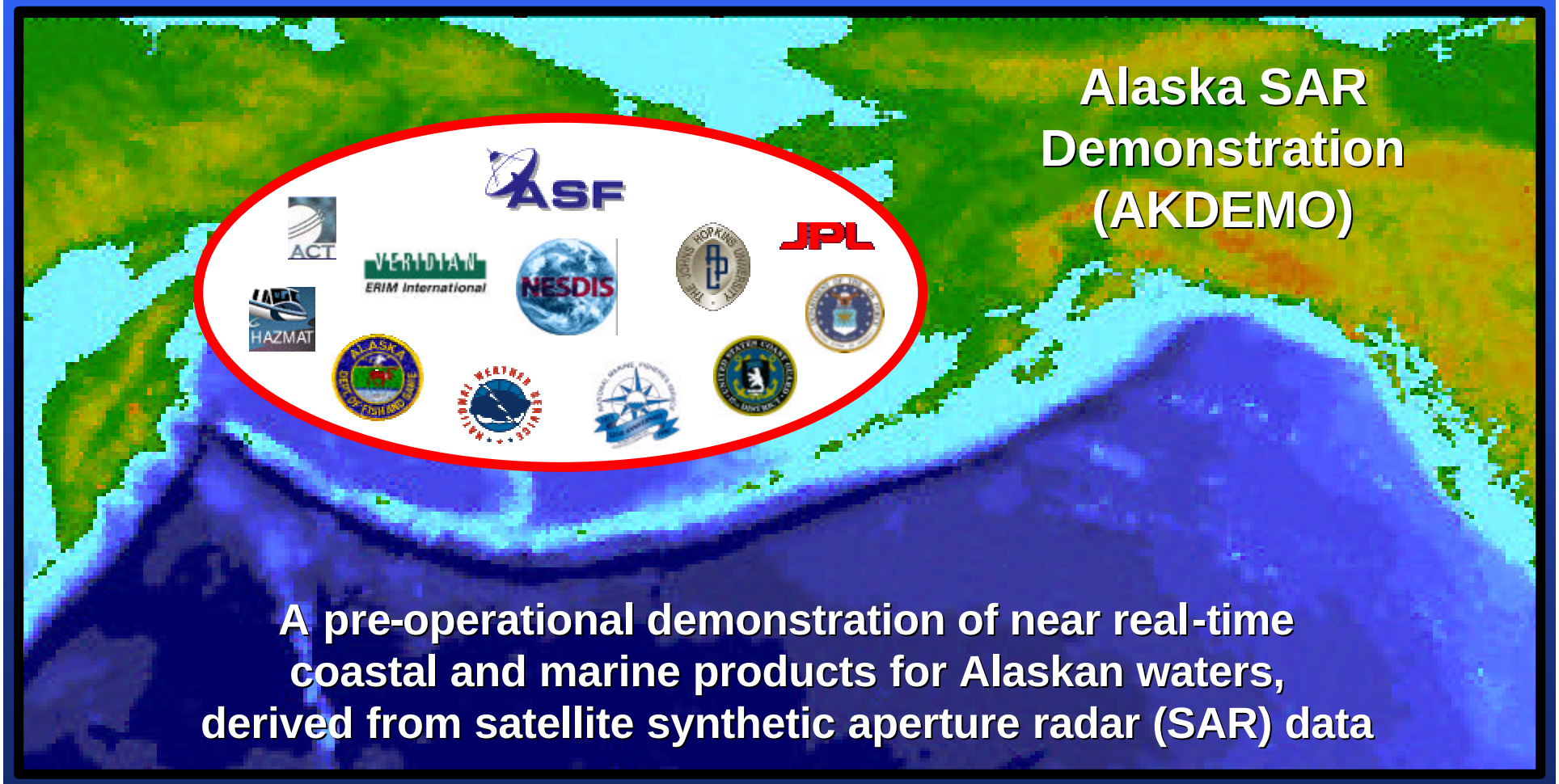
Alaska SAR Demonstration (AKDEMO)

Overview and Status of Alaska SAR Demonstration

William Pichel and Pablo Clemente-Colón, ORA Oceanic Research and Applications Division

Alaska SAR Demonstration User Meetings September 26-28, 2000

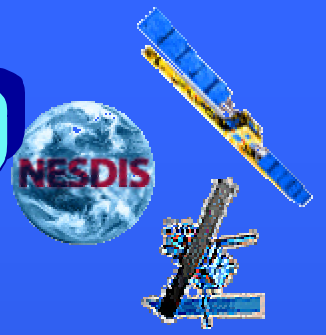
NOAA Alaska SAR Demo



Alaska SAR Demonstration (AKDEMO)

A pre-operational demonstration of near real-time coastal and marine products for Alaskan waters, derived from satellite synthetic aperture radar (SAR) data

NOAA Alaska SAR Demo



AKDEMO Goals:

1. Develop, test, and validate prototype SAR products that respond to critical data needs of operational users not satisfied with present observational data in the Alaska region.

2. Provide sustained automatic production and near-real time delivery of SAR and ancillary data and products via the Internet for trial use by operational agencies in Alaska.

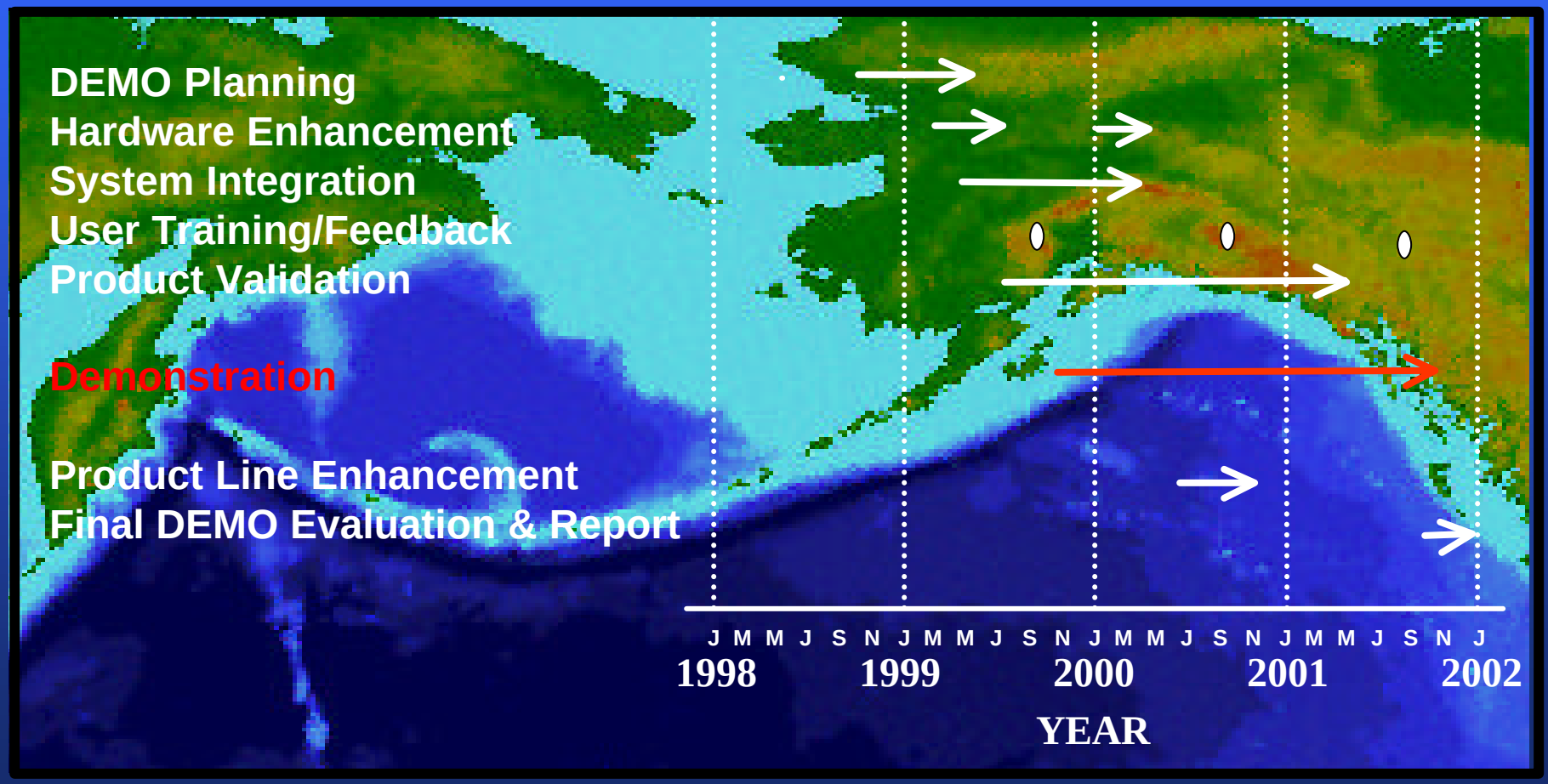
3. Familiarize the operational user community in the region with the interpretation and use of SAR image data and derived products.

NOAA Alaska SAR Demo

Alaska SAR Demo Users:	Applications
NOAA NWS Alaska Region Alaska CoastWatch Node	High-resolution Winds, Storm & Ice Warnings
USCG 17th District	Fishing Enforcement
Alaska Department of Fish & Game	Fisheries Management
NOAA NMFS	Enforcement & Research
U.S. Air Force, Elmendorf AFB	Storms and Winds
NOAA HAZMAT	Ice and Oil Spills

NOAA Alaska SAR Demo

Demonstration Timeline:



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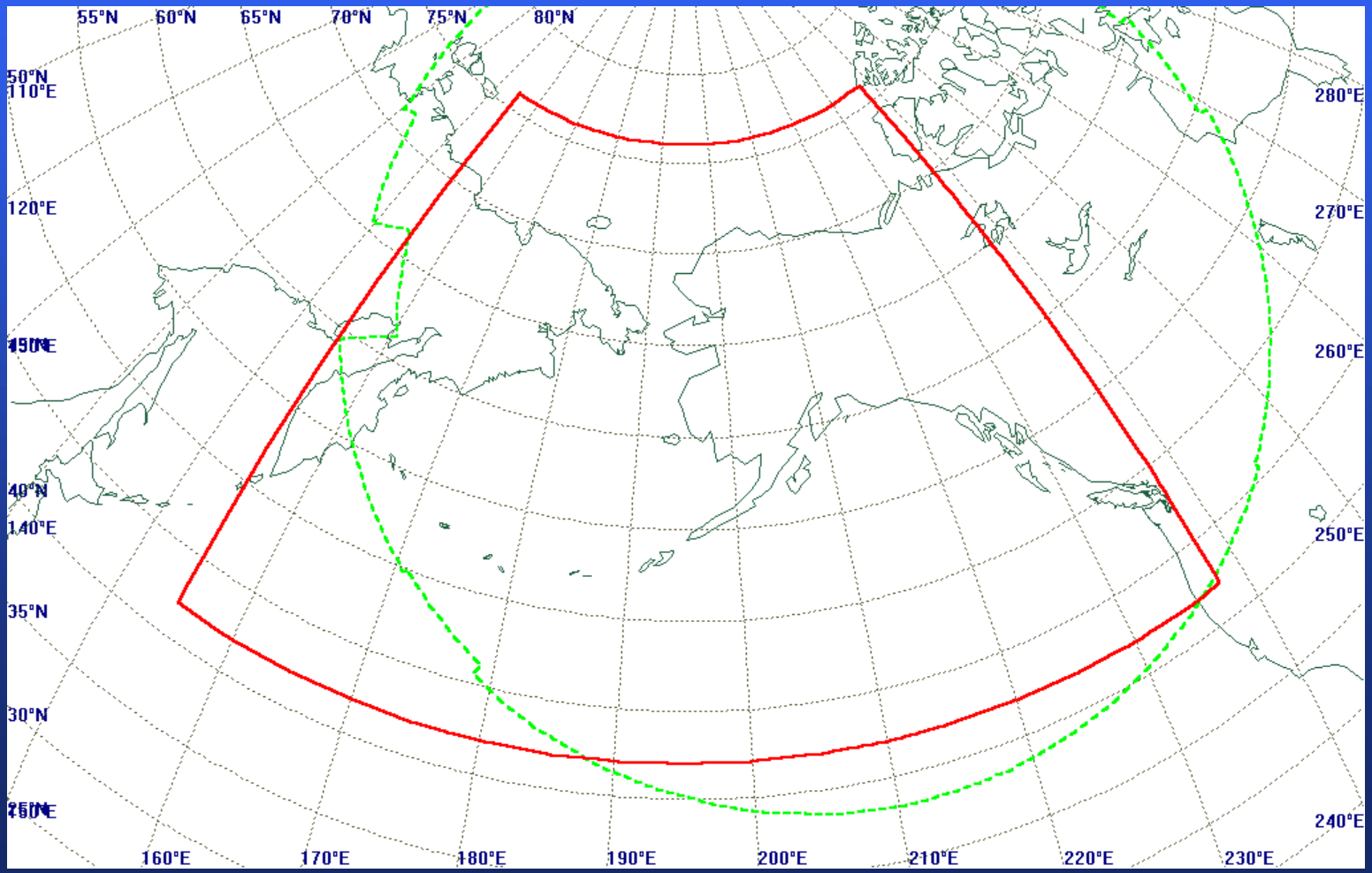
Alaska SAR Demo

NESDIS

ALASKA SAR DEMONSTRATION REGION



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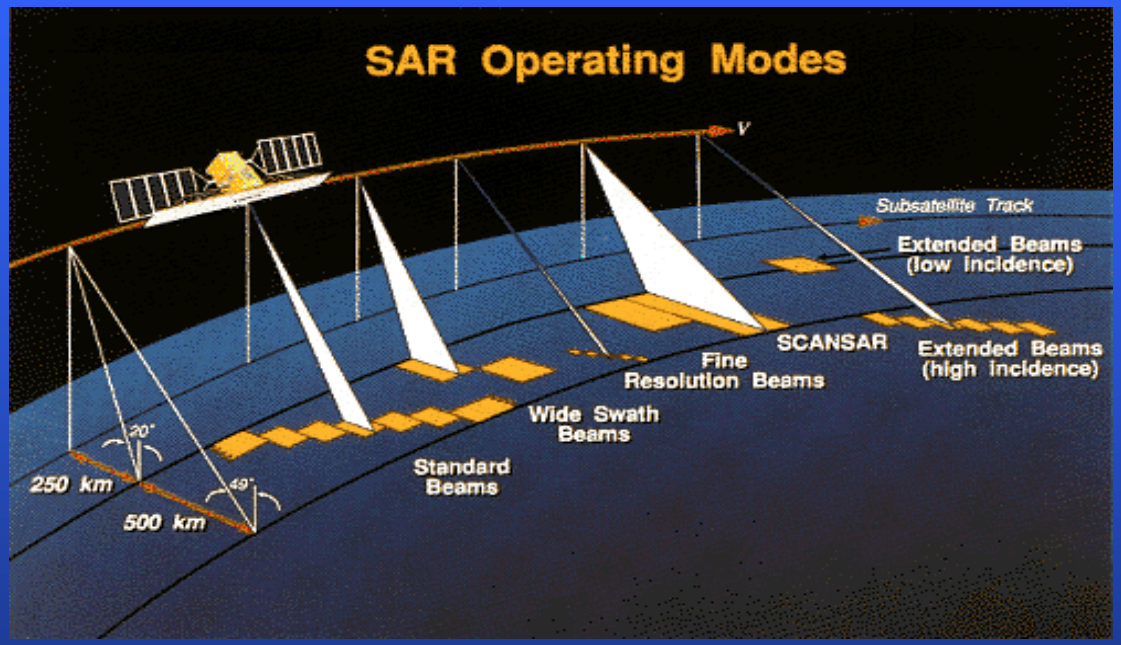
Alaska SAR Demo

NESDIS

RADARSAT-1



SAR BEAM MODES

SAR CHARACTERISTICS

C-band wavelength (5.6cm)
HH polarization
Right looking, steerable antenna
7 beam modes and 35 beam positions
ScanSAR capability for wide area coverage
Multiple image modes

Alaska SAR Demo

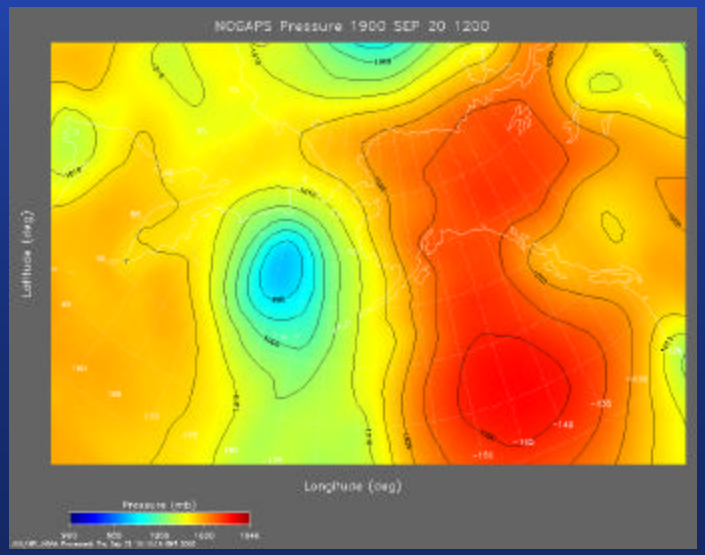
NOAA NESDIS

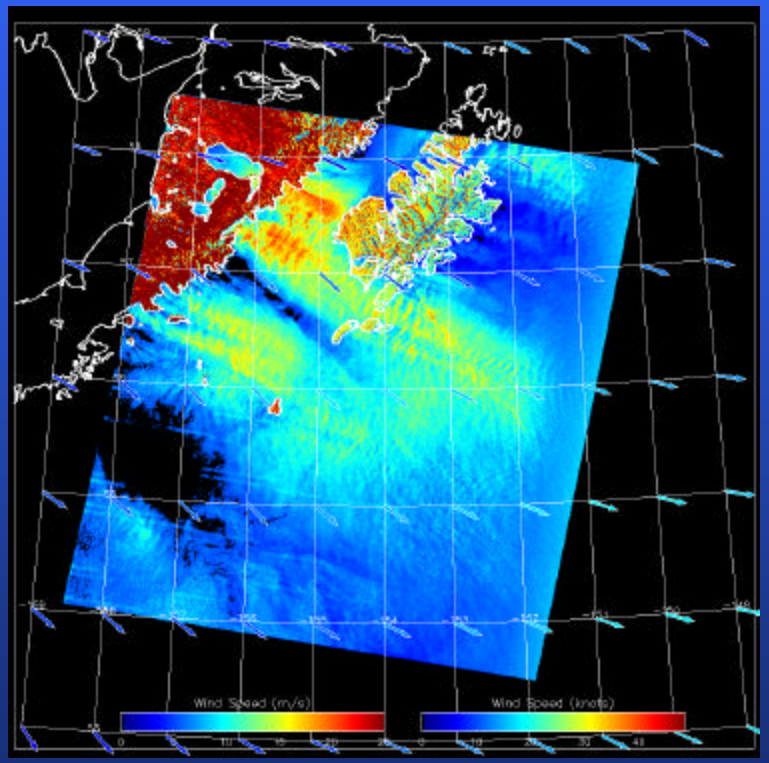
Alaska SAR Demonstration

Initial Product Implementation - October 1999

WEB SITE

ANCILLARY FIELDS





8/8/00 16:37 GMT

WIND IMAGES

NOAA Alaska SAR Demo

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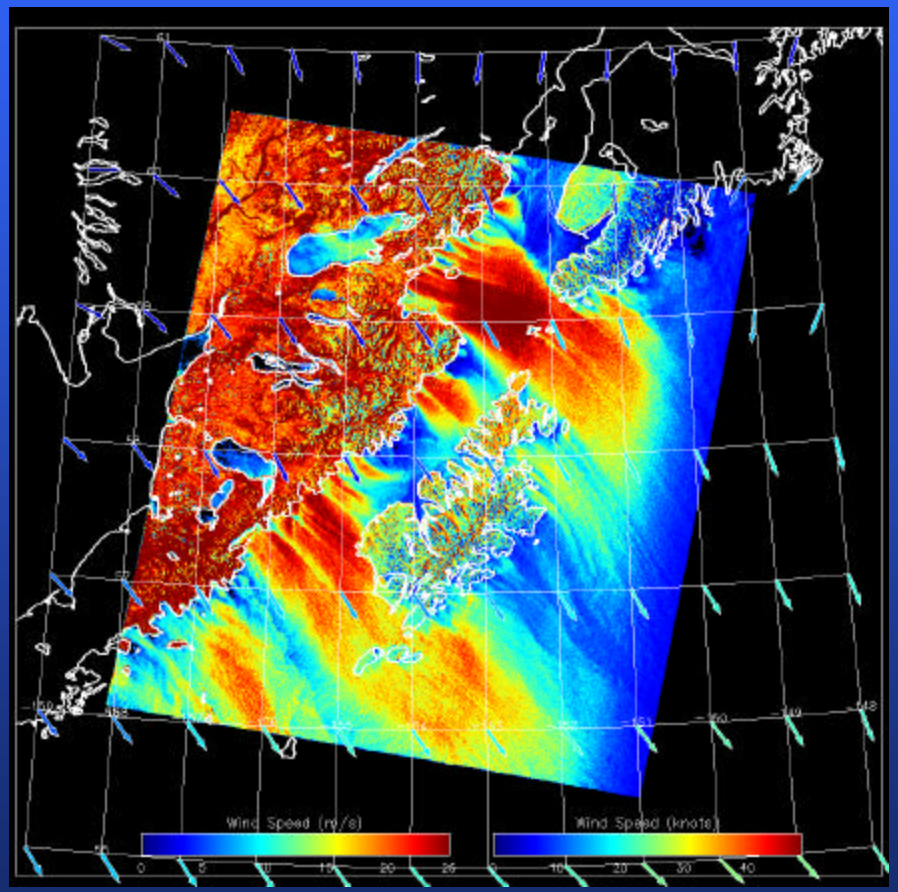
SAR Wind Speed Product

INPUT: SAR Radar Cross Section
SAR Incidence Angle
Model Wind Direction Field

ALGORITHM: CMOD4
Vertical/Horizontal
Polarization Ratio

OUTPUT: Mapped 1 km
Resolution SAR
Wind Estimates



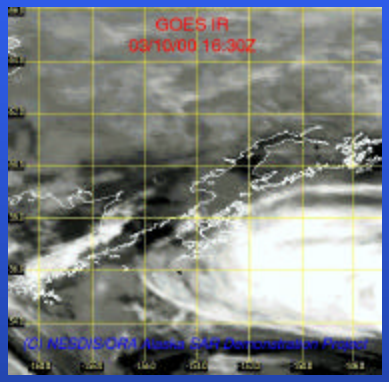
SAR WIND SPEED MAP

October 25, 1999 16:37 GMT

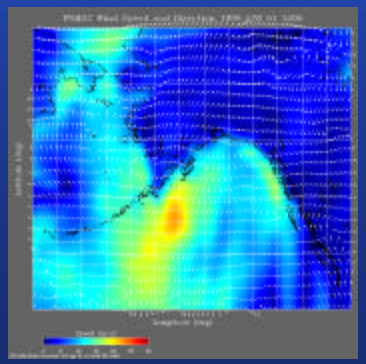
NOAA Alaska SAR Demo

ANCILLARY DATA

- SATELLITE IMAGERY and PRODUCTS
  - GOES VIS and IR Imagery
  - QuikSCAT and ERS-2 Scatterometer Winds
  - SSM/I Passive Microwave Winds
  - AVHRR SST Fields

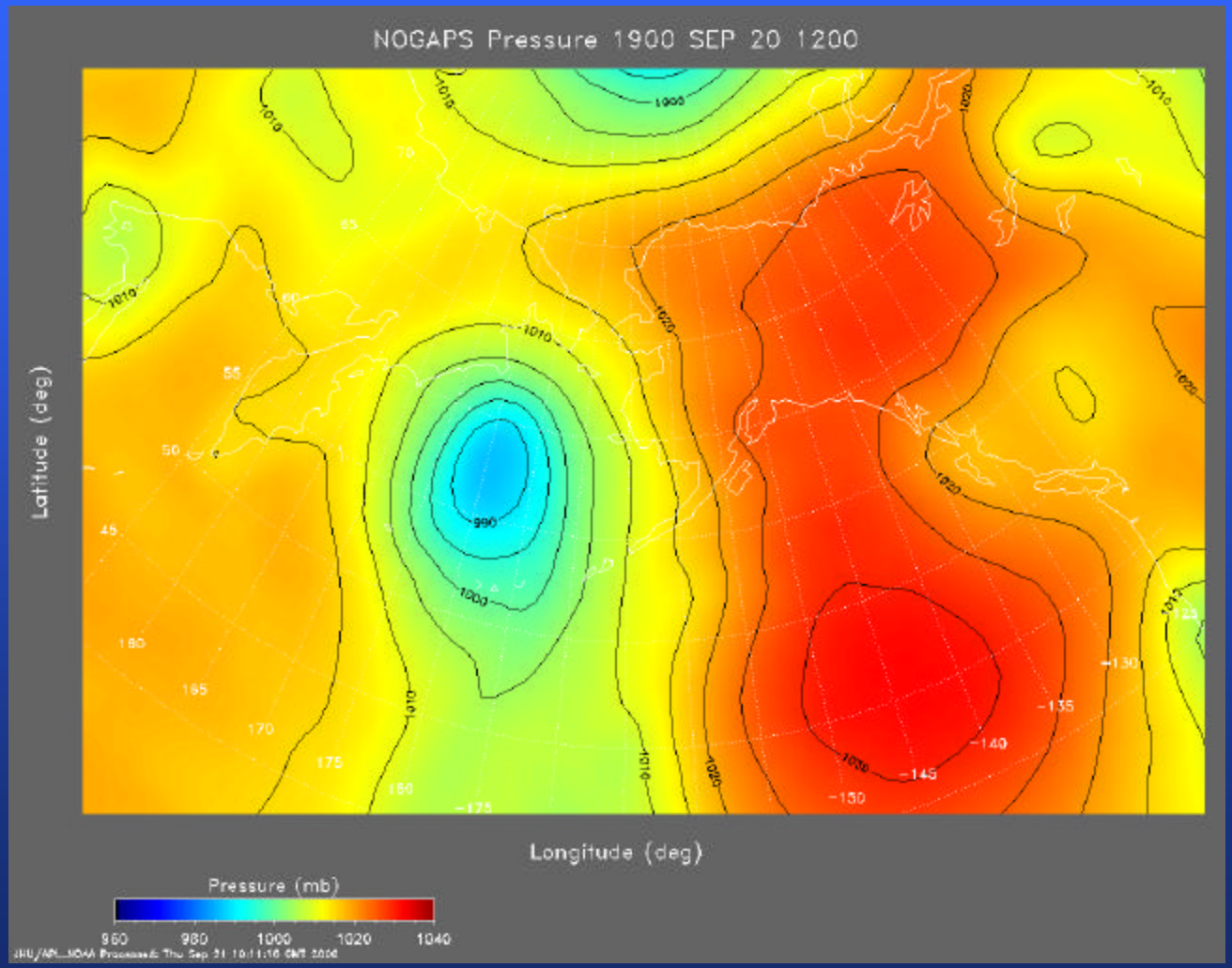


- Model Wind and Wave Analyses



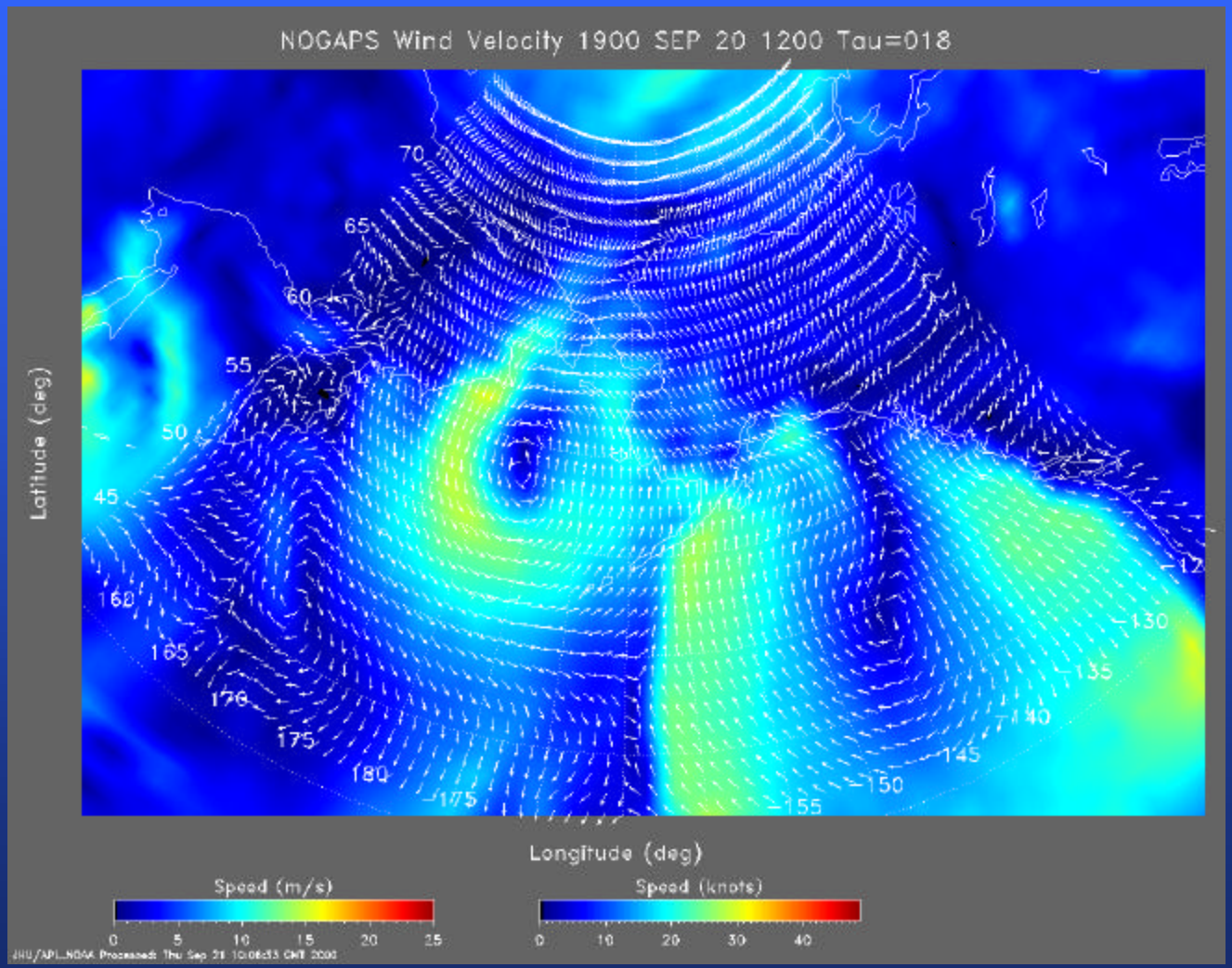
- Buoy Wind and Wave Reports

NOAA Alaska SAR Demo



NOGAPS Surface Pressure Field 9/20/00 12Z

NOAA Alaska SAR Demo

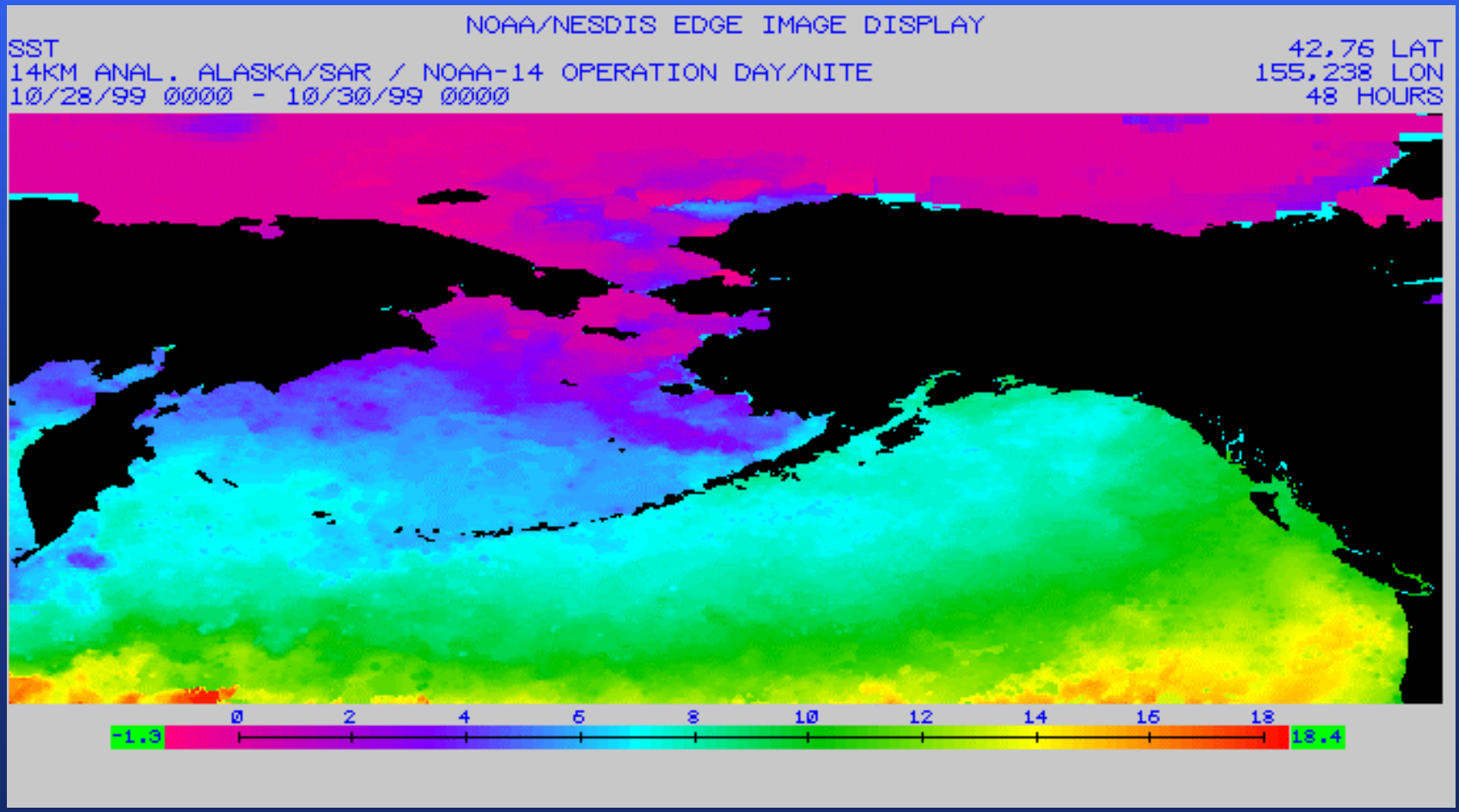


NOGAPS Surface Wind Field 9/20/00 12Z

NOAA Alaska SAR Demo

NESDIS

NESDIS 14 km SST Analysis



NOAA Alaska SAR Demo

NESDIS

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- WIPE System
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ALASKA SAR DEMONSTRATION

A demonstration of near real-time SAR applications in Alaska began in the fall of 1999, with an anticipated duration of at least 2 years. The areas of interest are coastal Alaska waters of the Bering Sea, Beaufort Sea, Chukchi Sea, and Northern Gulf of Alaska (42° N - 76°N, 122° W – 155° E). Goals for the demonstration include: 1) Validate and test prototype SAR products that respond to critical needs not satisfied with present observational data in the Alaska region; 2) Provide SAR imagery and derived products in near real-time via the Internet for trial use by operational agencies; and 3) Familiarize operational agencies with SAR image data and products.

Contact Information:
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Email: wpichel@nesdis.noaa.gov or pablo@orbit.nesdis.noaa.gov

ALASKA SAR DEMONSTRATION WEB SITE: http://orbit35i.nesdis.noaa.gov/orad/sar

NOAA Alaska SAR Demo

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Documentation

SAR Products

WIPE System

Scientific Papers

Ancillary Products

Feedback

Alaska SAR Demonstration

Presented by Bill Pichel at demonstration training, September, 1999. PDF format.

Alaska SAR Imagery Manual

Presented by Karen Friedman at demonstration training, September, 1999. PDF format.

Introduction to SAR

Presented by Chris Wackerman, ERIM International Inc., at demonstration training, September, 1999. PDF format.

ERIM International Inc. Demo Products: Ships and Winds

Presented by Chris Wackerman, ERIM International Inc., at demonstration training, September, 1999. PDF format.

Estimation of High Resolution Wind Speed from Spaceborne SAR

Presented by Frank Monaldo, JHUAPL, at demonstration training, September, 1999. PDF format.

DOCUMENTATION

NOAA Alaska SAR Demo

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Gulf of Alaska Model Fields

Data for fields provided by the US Navy Master Environmental Library

Wind Velocity	SWH	Wave Period	Pressure	Air Temp	Sea Temp	Air-Sea Temp	Inverse Wave Age
Dec 2000	Dec 2000	Dec 2000	Dec 2000	Dec 2000	Dec 2000	Dec 2000	Dec 2000
Nov 2000	Nov 2000	Nov 2000	Nov 2000	Nov 2000	Nov 2000	Nov 2000	Nov 2000
Oct 2000	Oct 2000	Oct 2000	Oct 2000	Oct 2000	Oct 2000	Oct 2000	Oct 2000
Sep 2000	Sep 2000	Sep 2000	Sep 2000	Sep 2000	Sep 2000	Sep 2000	Sep 2000
Aug 2000	Aug 2000	Aug 2000	Aug 2000	Aug 2000	Aug 2000	Aug 2000	Aug 2000
Jul 2000	Jul 2000	Jul 2000	Jul 2000	Jul 2000	Jul 2000	Jul 2000	Jul 2000
Jun 2000	Jun 2000	Jun 2000	Jun 2000	Jun 2000	Jun 2000	Jun 2000	Jun 2000
May 2000	May 2000	May 2000	May 2000	May 2000	May 2000	May 2000	May 2000
Apr 2000	Apr 2000	Apr 2000	Apr 2000	Apr 2000	Apr 2000	Apr 2000	Apr 2000
Mar 2000	Mar 2000	Mar 2000	Mar 2000	Mar 2000	Mar 2000	Mar 2000	Mar 2000
Feb 2000	Feb 2000	Feb 2000	Feb 2000	Feb 2000	Feb 2000	Feb 2000	Feb 2000
Jan 2000	Jan 2000	Jan 2000	Jan 2000	Jan 2000	Jan 2000	Jan 2000	Jan 2000
Dec 1999	Dec 1999	Dec 1999	Dec 1999	Dec 1999	Dec 1999	Dec 1999	Dec 1999
Nov 1999	Nov 1999	Nov 1999	Nov 1999	Nov 1999	Nov 1999	Nov 1999	Nov 1999
Oct 1999	Oct 1999	Oct 1999	Oct 1999	Oct 1999	Oct 1999	Oct 1999	Oct 1999
Sep 1999	Sep 1999	Sep 1999	Sep 1999	Sep 1999	Sep 1999	Sep 1999	Sep 1999
Aug 1999	Aug 1999	Aug 1999	Aug 1999	Aug 1999	Aug 1999	Aug 1999	Aug 1999

Frank_Monaldo@jhuapl.edu

ANCILLARY PRODUCTS

NOAA Alaska SAR Demo

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Wipe System

Scientific Papers

Ancillary Products

Feedback

Scientific Papers

Pichel, W.G., "NOAA CoastWatch SAR Applications and Demonstration: Status and Plans"

Monaldo, F. M., " Alaska SAR Demonstration and Near Real-Time Synthetic Aperture Radar Winds."

Thompson, D. R. and R. C. Beal, "Mapping High-Resolution Wind Fields Using Synthetic Aperture Radar."

Li, X., W. G. Pichel, F. Monaldo, C. Wackerman, R. Beal, P. Clemente-Colón, and K. S. Friedman, "Retrieval and Validation of Sea Surface Winds from Calibrated RADARSAT ScanSAR Images."

SCIENTIFIC PAPERS

NOAA

Alaska SAR Demo

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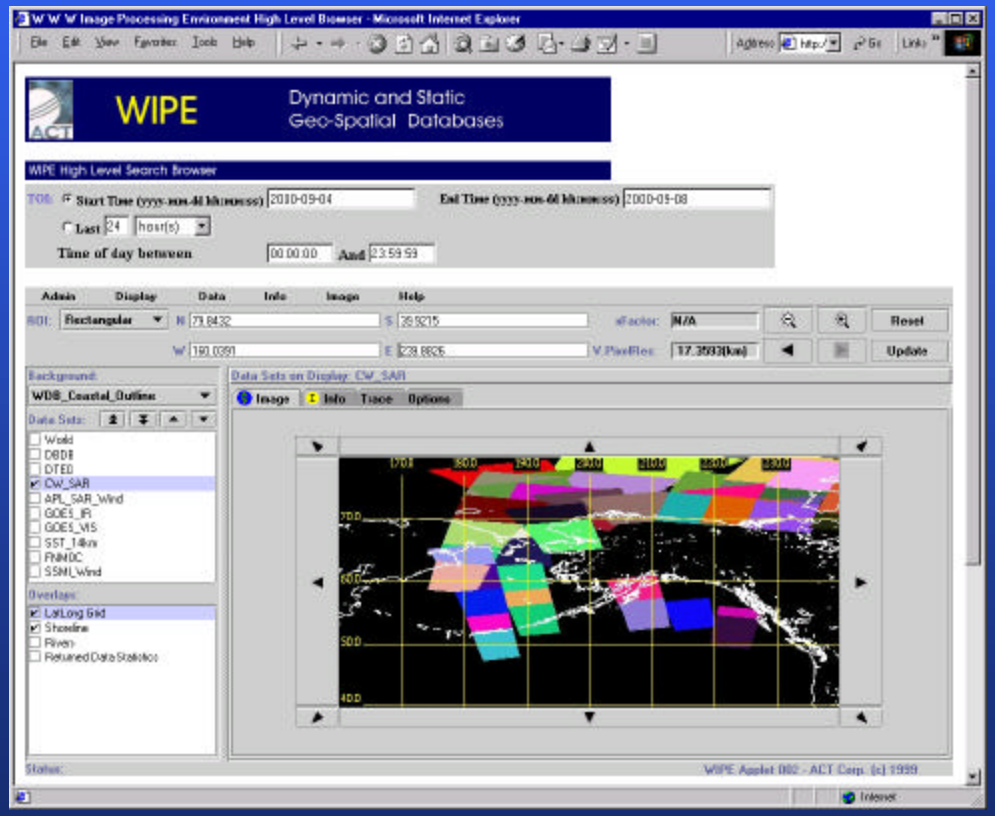
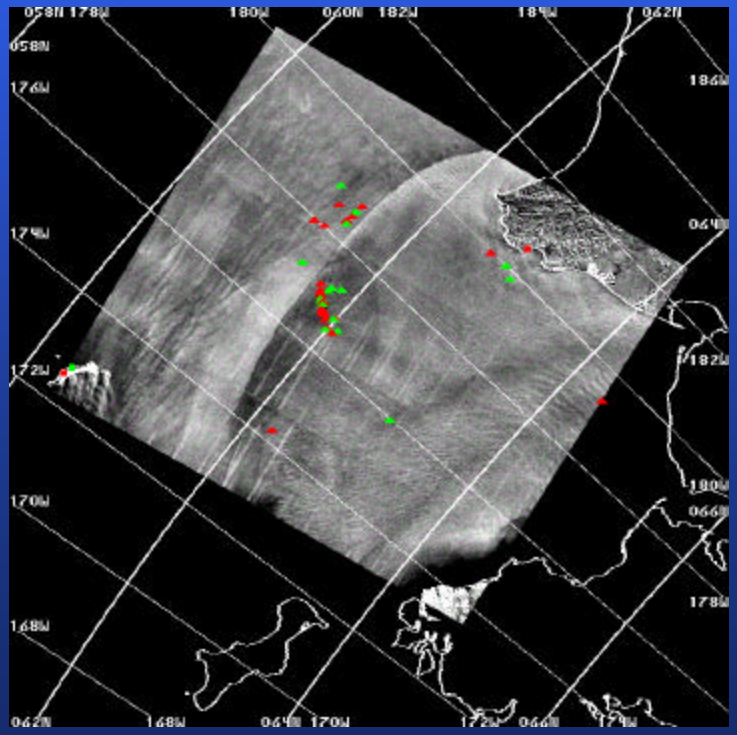
Alaska SAR Demonstration

Spring Implementation - March 2000



WWW IMAGE PROCESSING ENVIRONMENT (WIPE)



VESSEL DETECTION PRODUCTS

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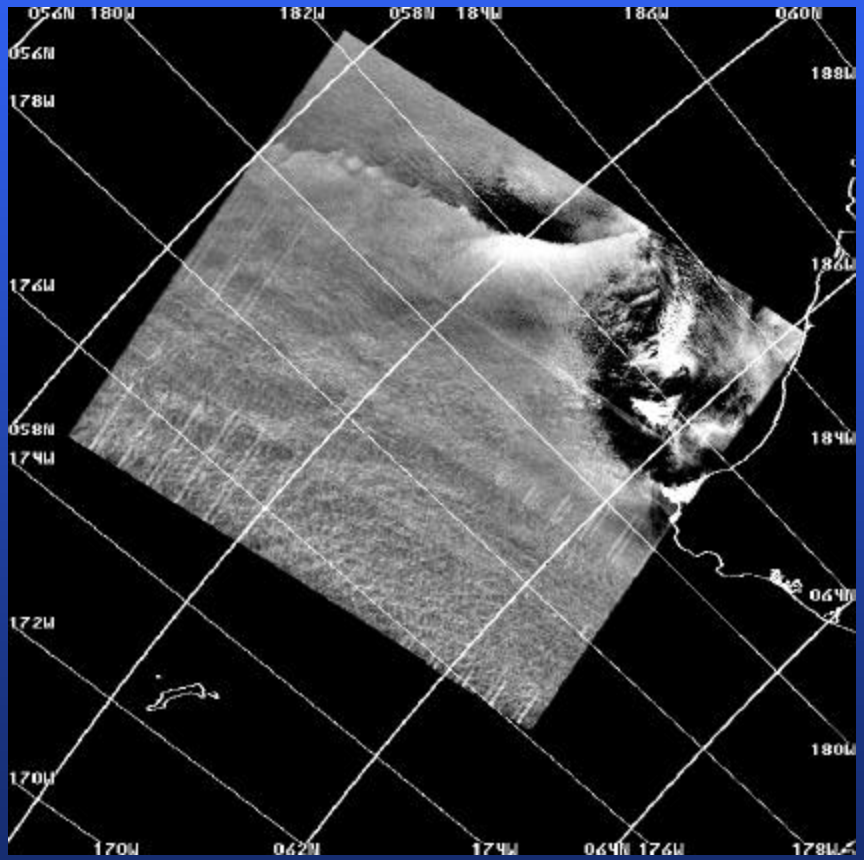
SAR Low-res Image Product

INPUT: SAR Radar Cross Section
SAR Incidence Angle

ALGORITHM: Flatten and Grid

OUTPUT: Low-res SAR Image



SAR Low-res Mapped Image
October 23, 1999

(C) CSA 1999

NOAA Alaska SAR Demo

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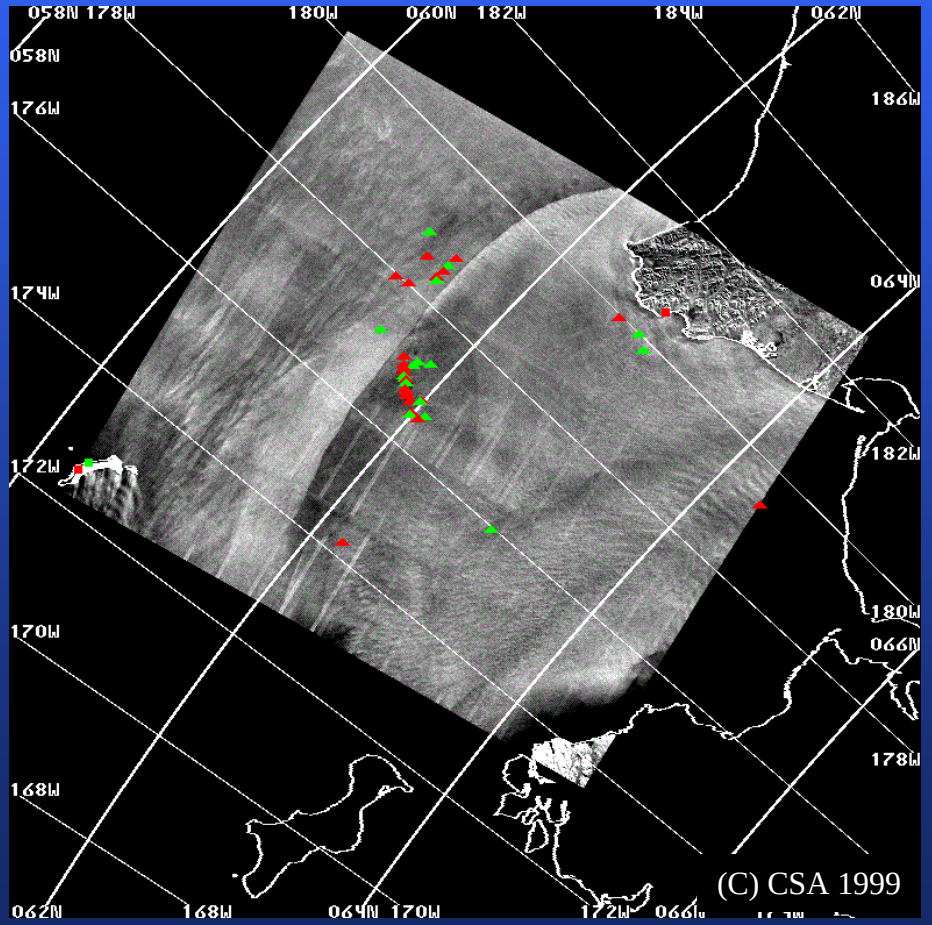
SAR Hard Target Detection Product

INPUT: Calibrated SAR Image

ALGORITHM: Constant False Alarm Rate

OUTPUT: Text List of Ship Lat/Long Positions
Low-res image with ship positions superimposed



SAR HARD TARGET DETECTION MAP 9/26/99

NOAA Alaska SAR Demo

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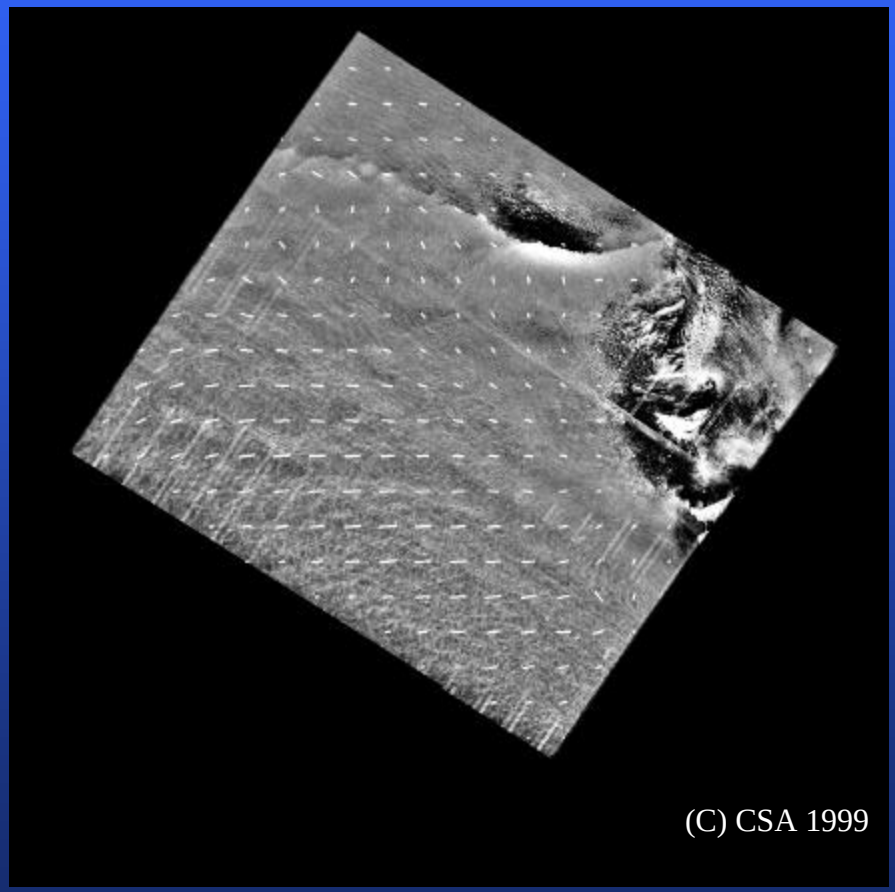
SAR Wind Vector Product

INPUT: SAR Radar Cross Section
SAR Incidence Angle

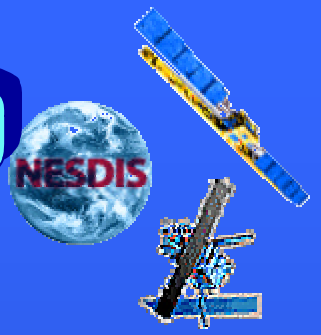
ALGORITHM: Wind Direction from Wind-aligned Features in SAR Image Speed from Two-scale Model

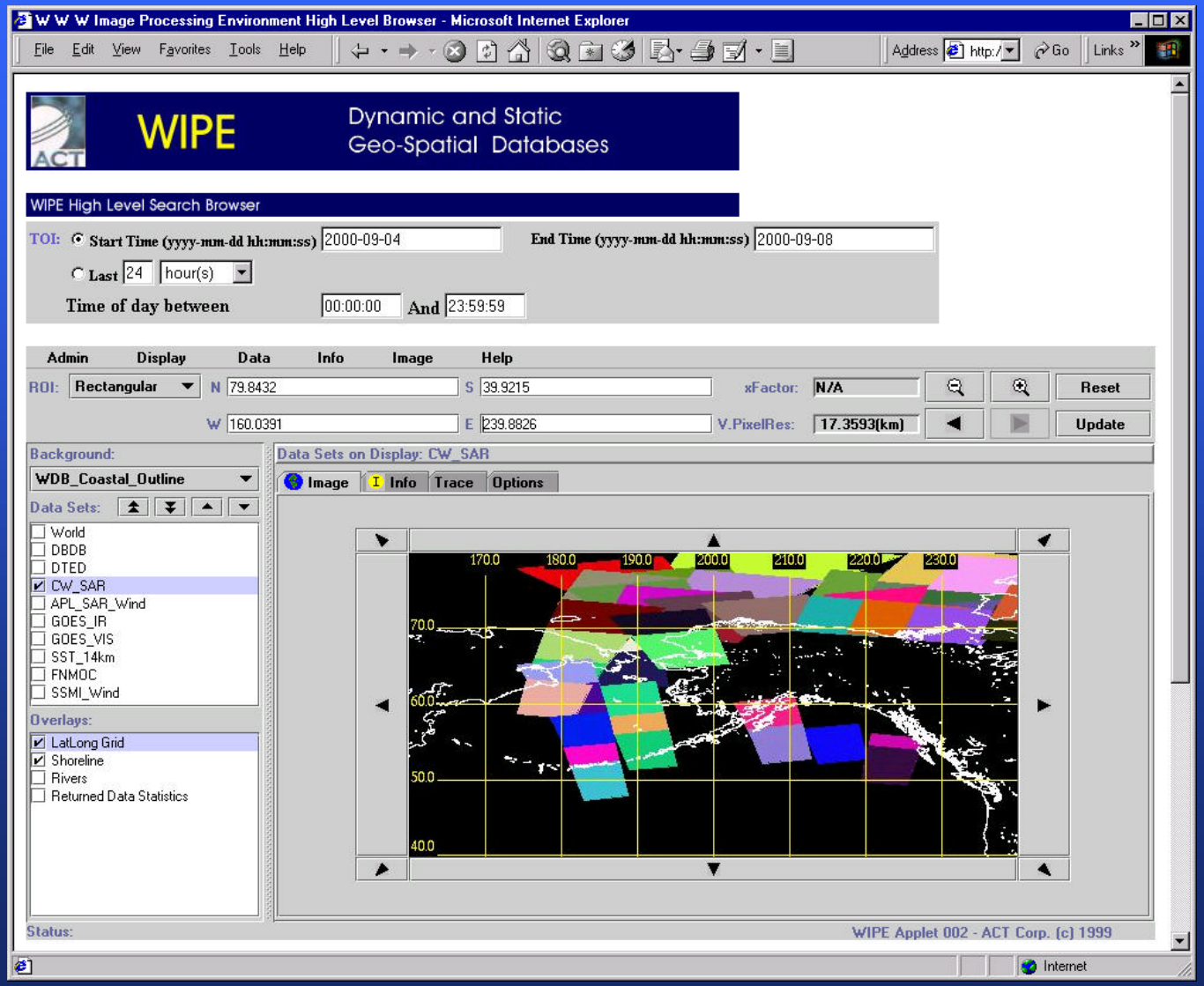
OUTPUT: Grid of Wind Vectors with 180° Ambiguity
Low-res SAR Image with Wind Vectors



SAR WIND VECTOR MAP
October 23, 1999

NOAA Alaska SAR Demo



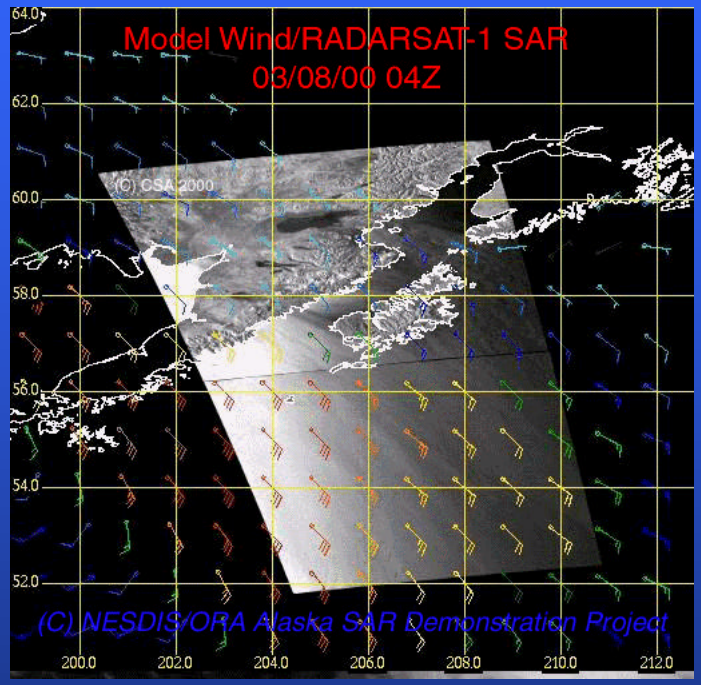


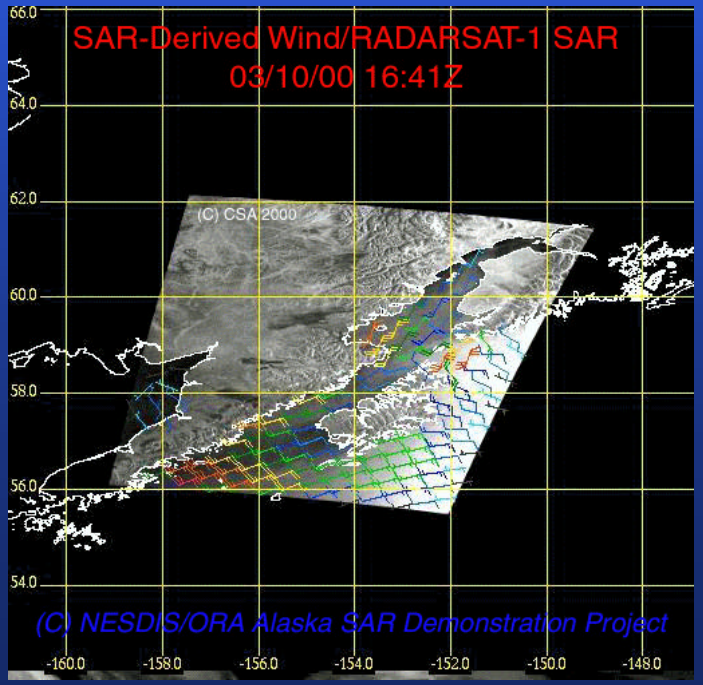
WWW Image Processing Environment

- Provides improved access to large volumes of georeferenced SAR data, products, and ancillary data through a GIS-like tool.

DATA/PRODUCT BROWSER INTERFACE

NOAA Alaska SAR Demo





WWW Image Processing Environment

- Display of coincident image and overlay products
- On-line analyses
- Data output into scientific and GIS formats

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Alaska SAR Demo

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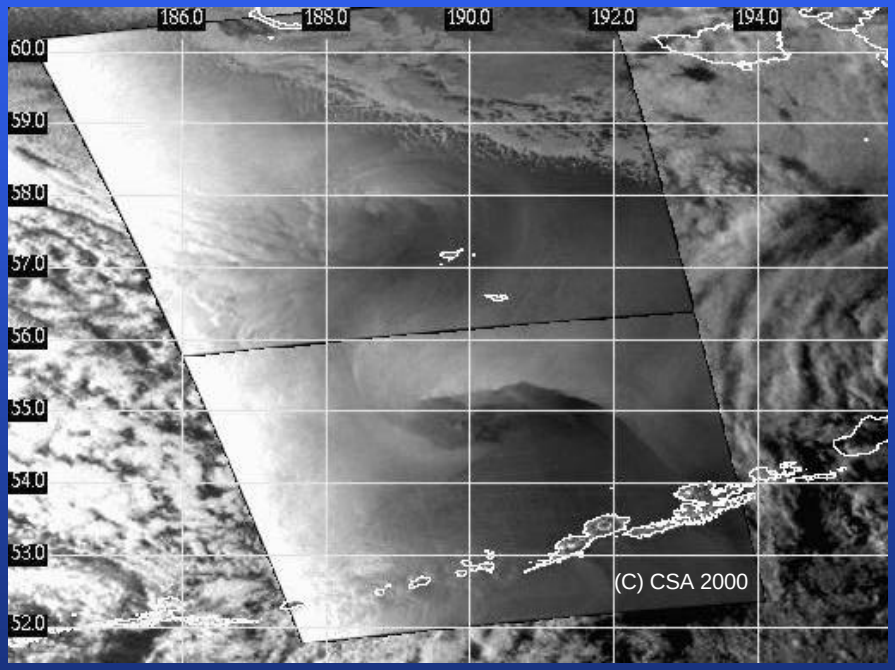
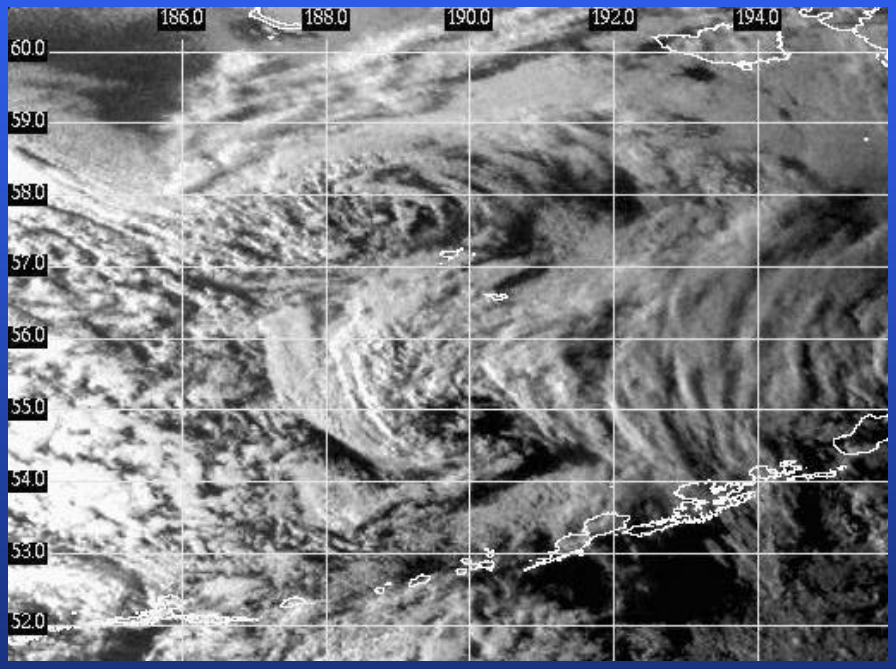


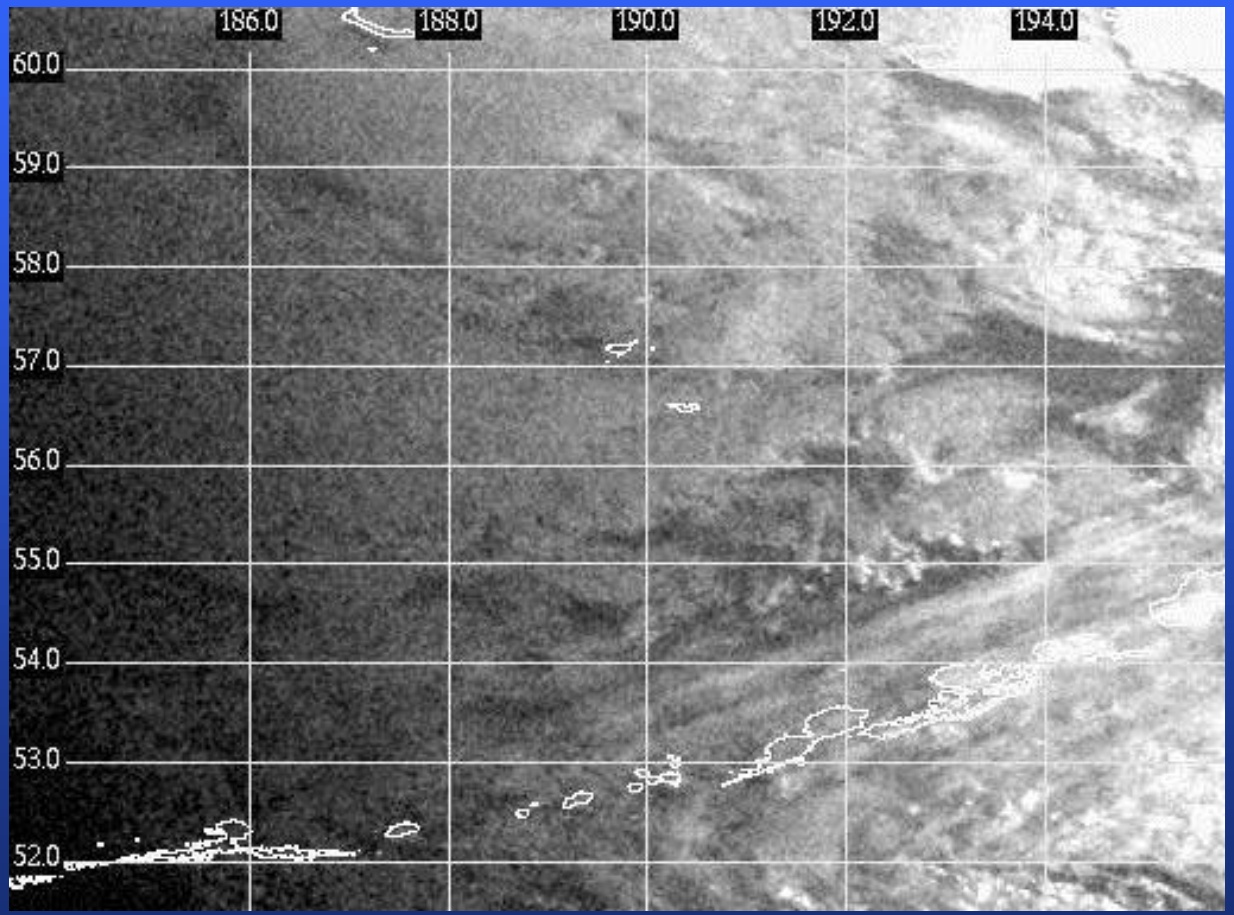
RADARSAT ScanSAR Wide B 100 m
4/8/00 1807Z



GOES West 1 km Visible
4/8/00 1800Z

Coincident SAR and GOES Visible Data

NOAA Alaska SAR Demo

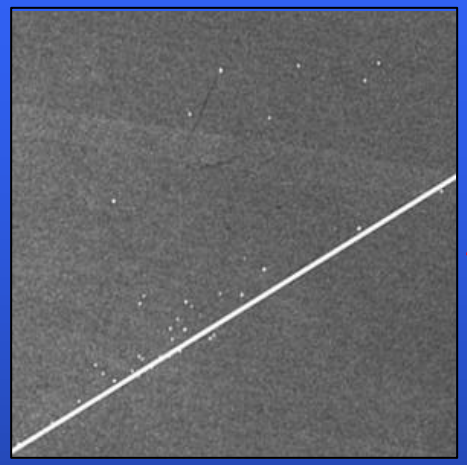


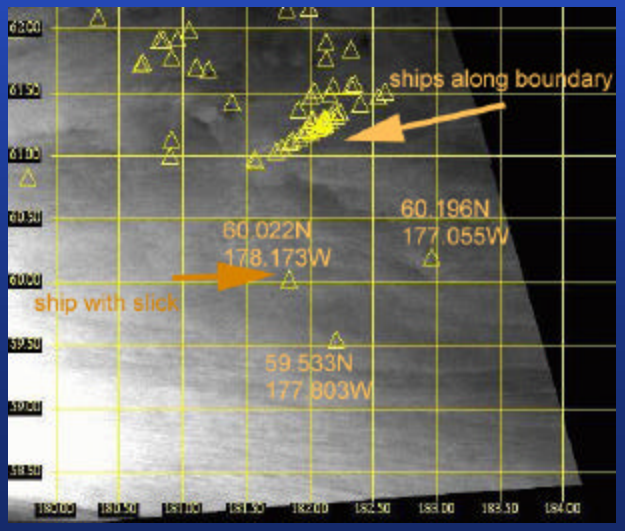
Animation of Mesoscale Cyclone in the Bering Sea
GOES West 1 km Visible 4/8/00 1700Z - 4/9/00 0600 Z
RADARSAT ScanSAR Wide B 100 m 4/8/00 1807Z & 4/9/00 0503Z

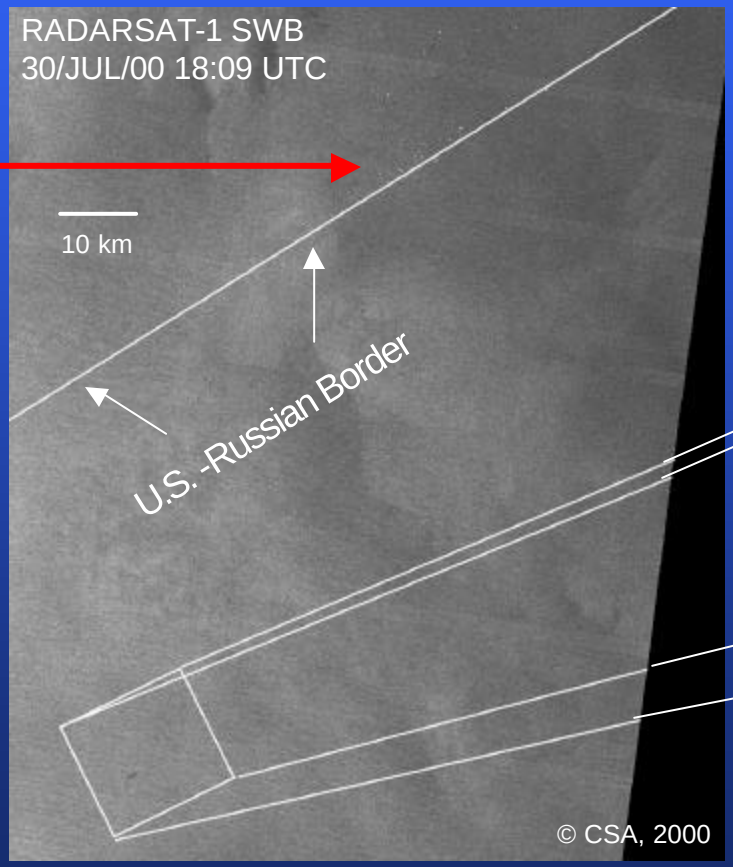
WWW Image Processing Environment

- Sequential Imagery Feature Analysis
- Built-in Animation
- GIF animation output

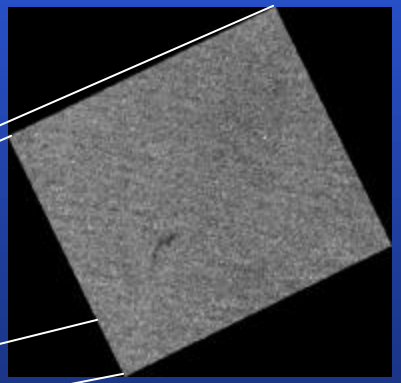
NOAA Alaska SAR Demo







"Coast Guard seized a Russian trawler 800 yards inside the U.S. EEZ on August 1, 2000."



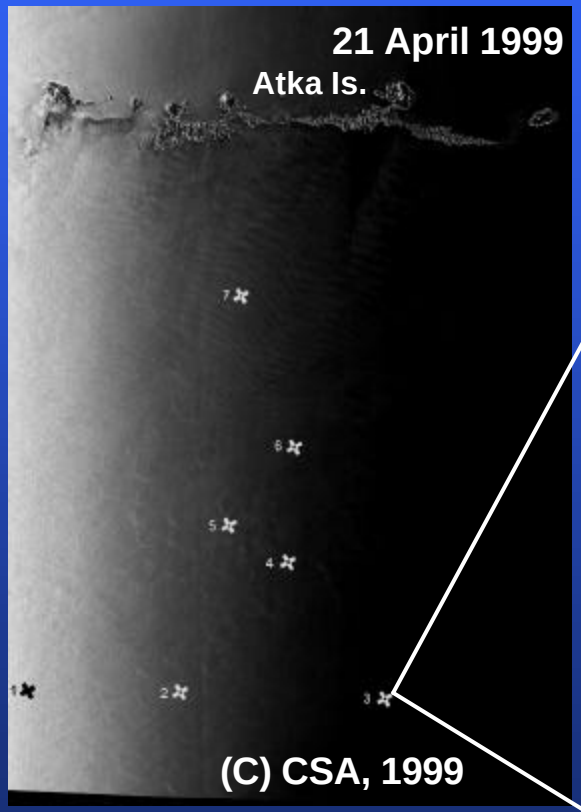
SAR IMAGE OF RUSSIAN FLEET AT U.S.-RUSSIAN BORDER ON JULY 30, 2000

NOAA Alaska SAR Demo

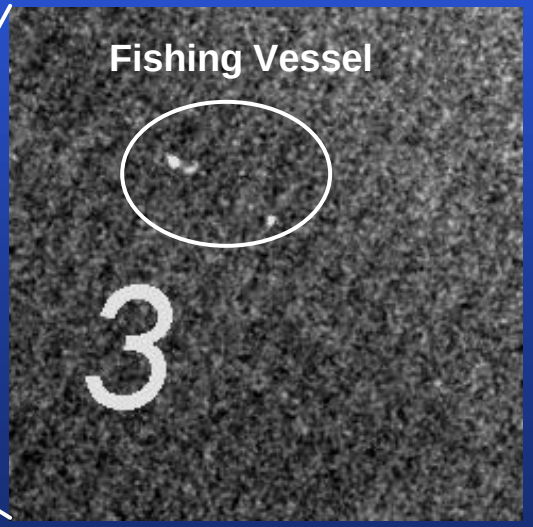
NESDIS

High Seas Drift Netting - Banned in International Waters for the past 7 years

Illegal drift net vessel



RADARSAT ScanSAR Wide Imagery - Aleutian Islands



Synthetic Aperture Radar (SAR) data from the Canadian RADARSAT satellite is being evaluated as a monitoring tool for high seas drift net fishing enforcement. No confirmed reports yet.

During 1999, 8 vessels were detected by plane and ship and 3 seized in the North Pacific in a monitoring program coordinated by the North Pacific Anadromous Fish Commission (with member countries of Canada, Japan, Russia, and U.S.).

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Alaska SAR Demo

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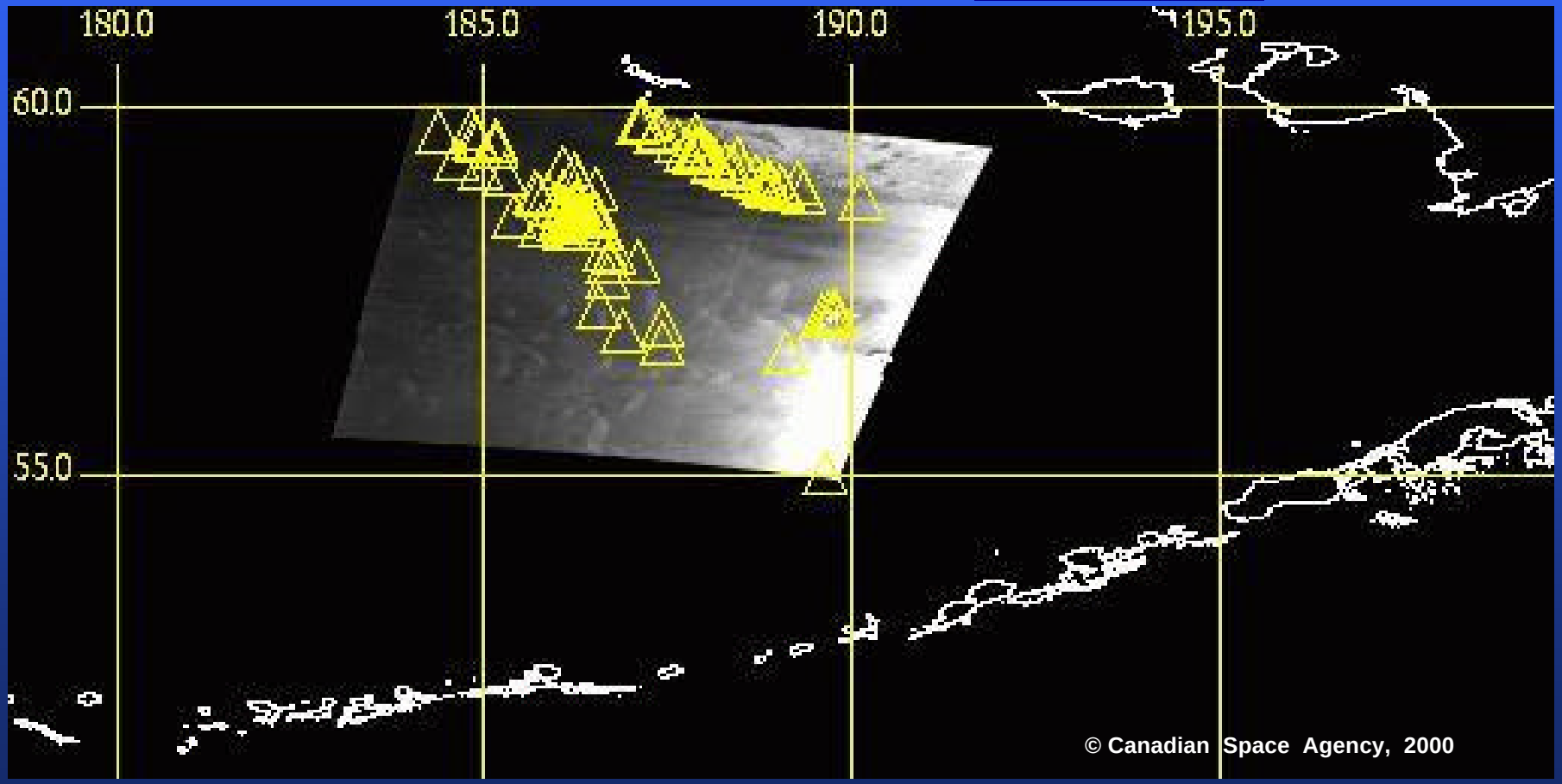
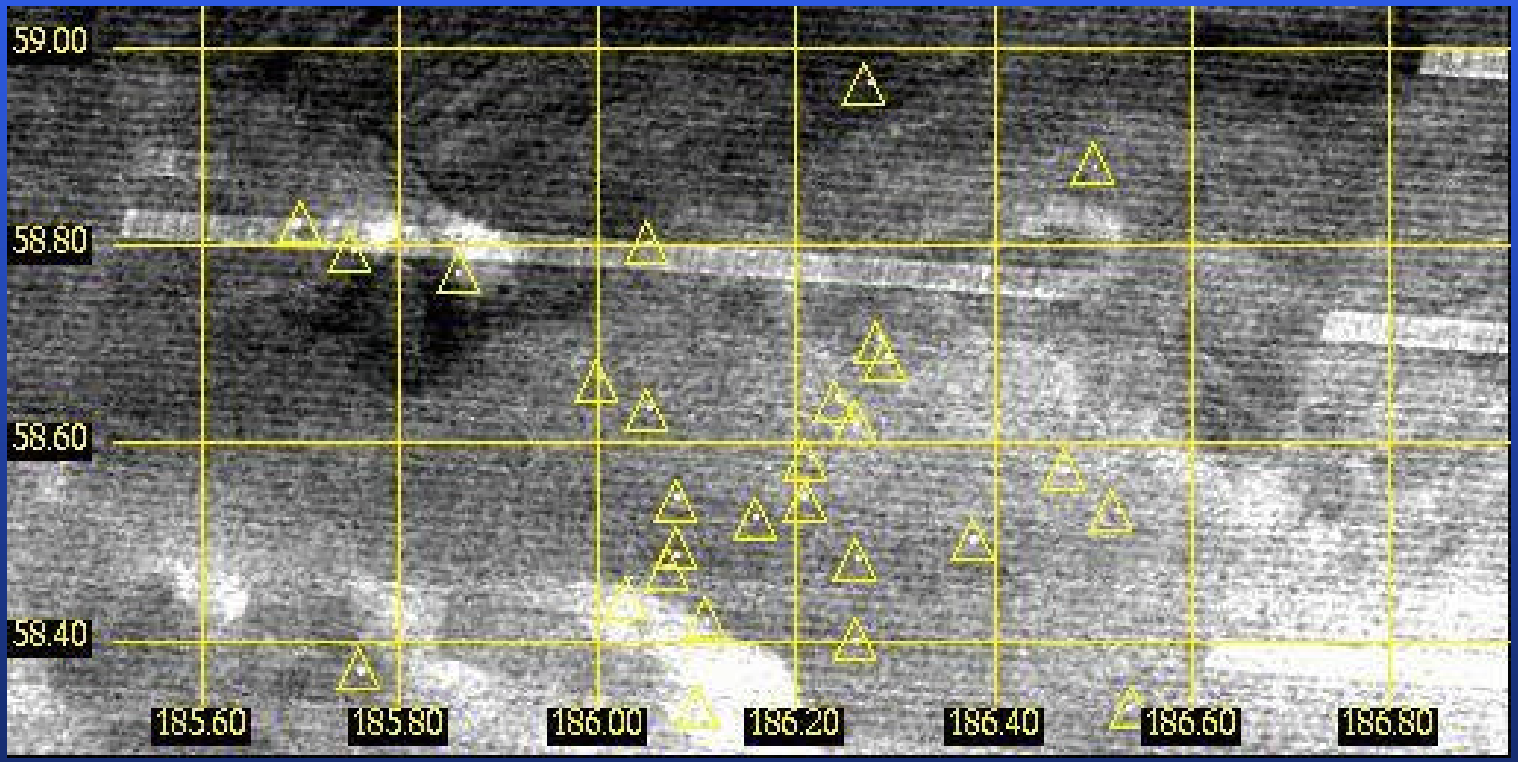


SNOW CRAB FLEET APRIL 4, 2000 17:53 GMT

NOAA Alaska SAR Demo



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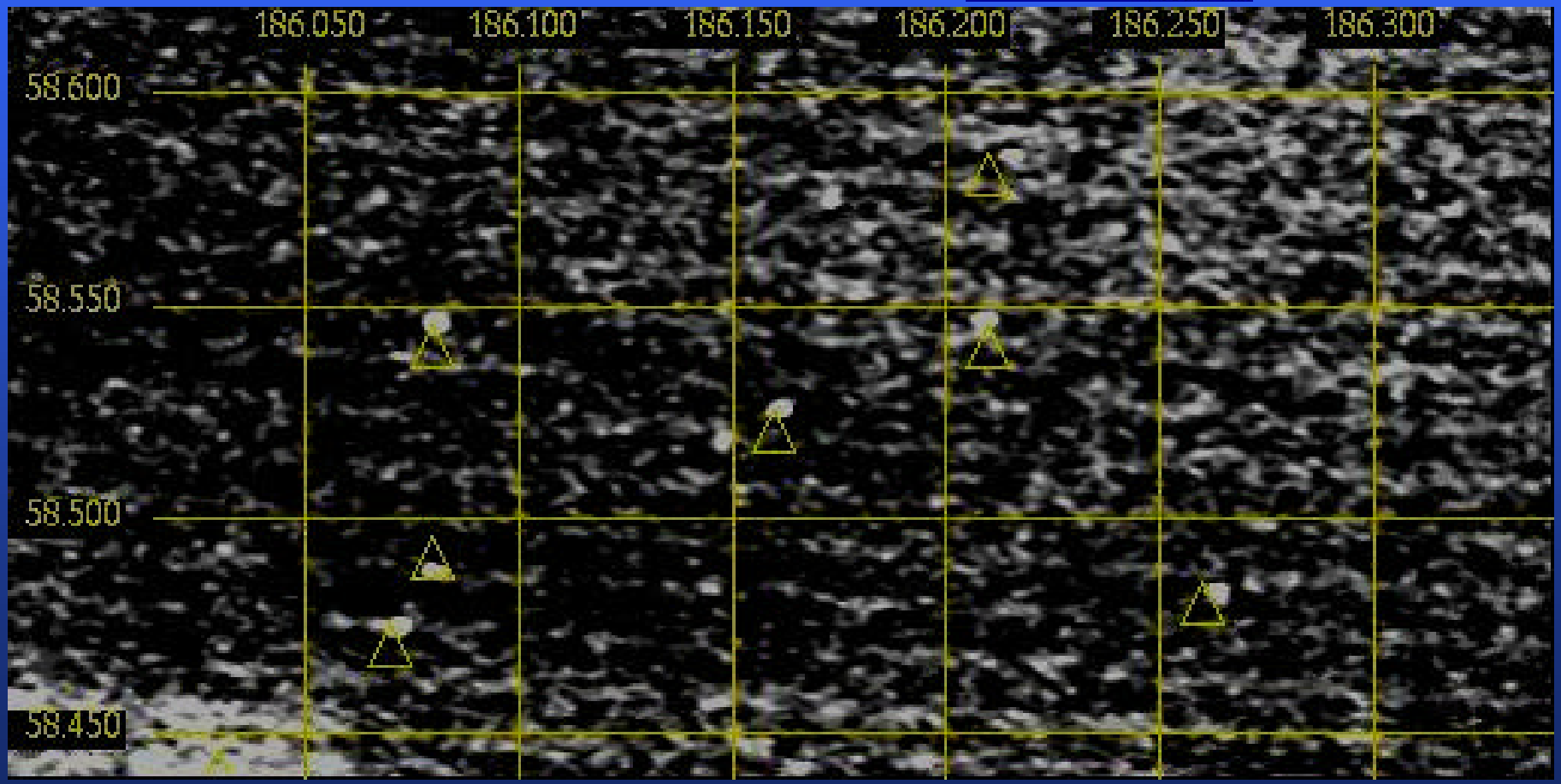
NOAA Alaska SAR Demo

NESDIS



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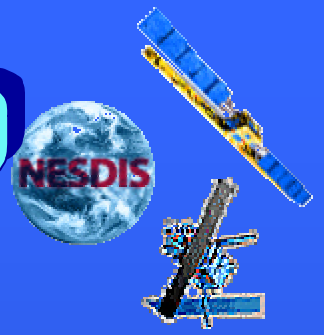
NOAA Alaska SAR Demo



Final Considerations:

1. Although the potential of spaceborne SAR for atmospheric observation has been known to scientists for over twenty years, with SAR data being regularly available to the federal government in particular since 1995, the AKDEMO project is the first effort anywhere in the world to provide SAR meteorological products in support of operational weather forecast activities.

2. SAR-derived information on fleet locations in Alaskan and international waters cannot be obtained by any other means.

3. The AKDEMO approach takes the burden of managing high volumes of data from the local user while providing each user with SAR and complementary data and information tailored to their requirements.

4. The AKDEMO concept is transportable to other U.S. coastal regions, particularly if local acquisition stations are made available, and should serve as preparation for the upcoming series of additional spaceborne SAR sensors.

NOAA

Alaska SAR Demo

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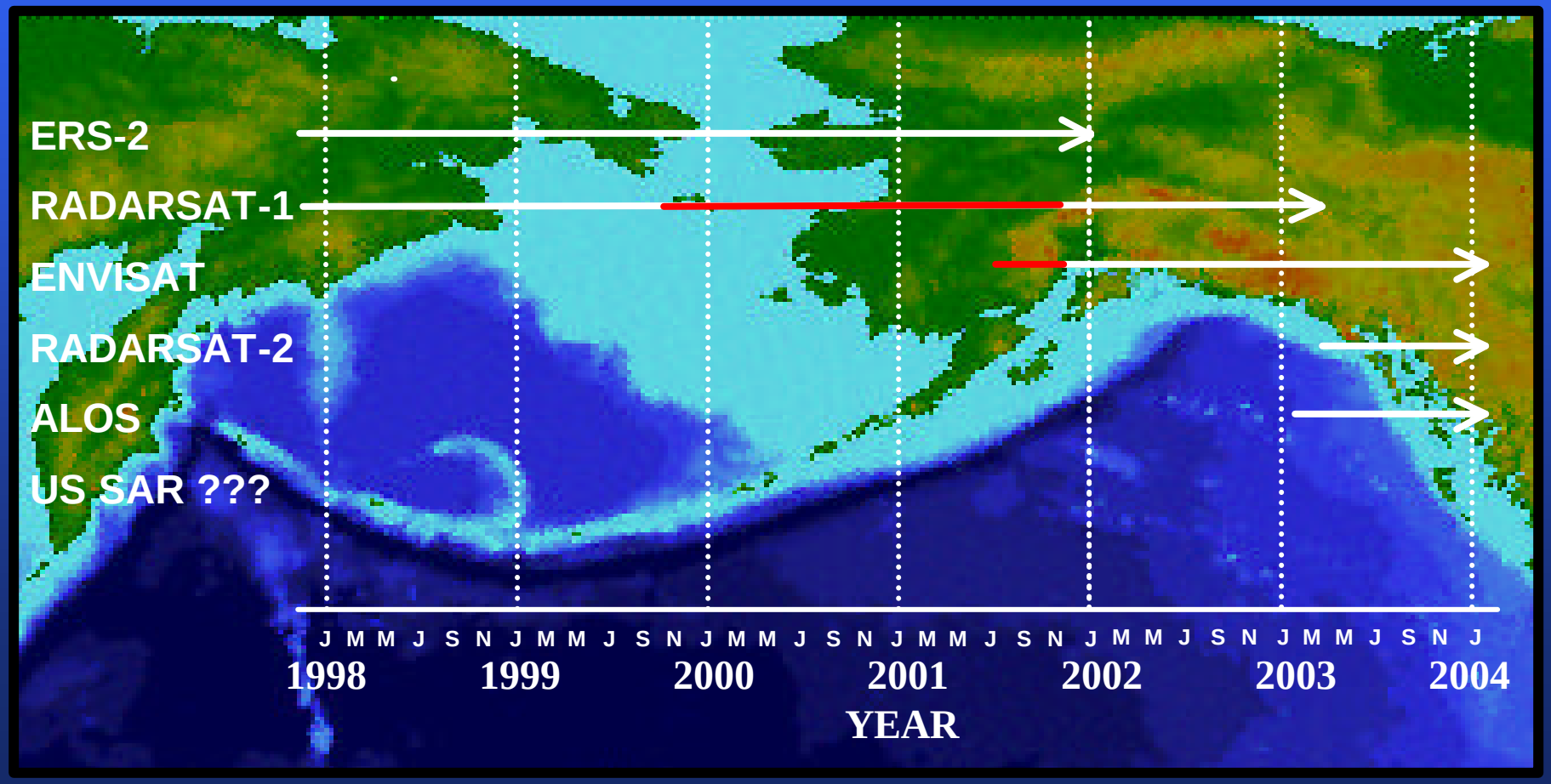
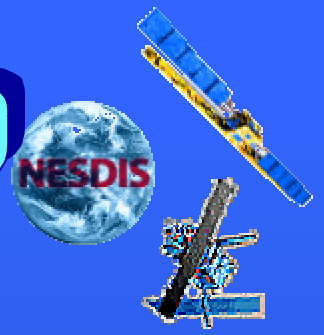
Present and Future Spaceborne SAR Missions:



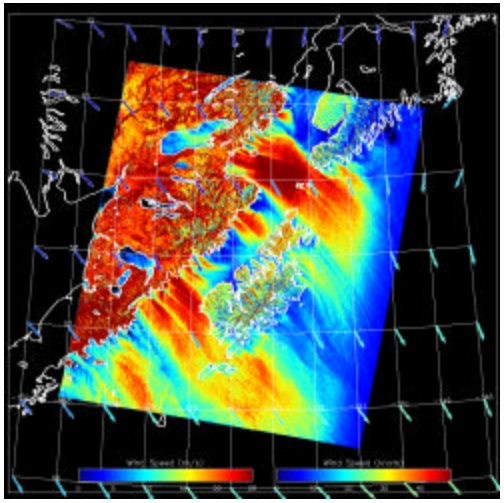
NOAA Alaska SAR Demo



ALASKA SAR DEMONSTRATION WEBSITE:

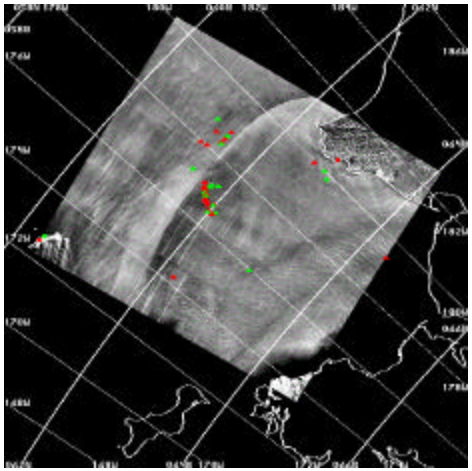
http://orbit35i.nesdis.noaa.gov/orad/sar/

NOAA Alaska SAR Demo



Winds

Vessels



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